Section 3.5 More Patterns

Curriculum Outcomes	Related Activities	Page in Text
• demonstrate and understanding of the zero product property and its relationship to solving equations by factoring	• explore non-linear curves and summarize patterns for developing and using an equation	130
• use concrete materials, pictorial; representations, and algebraic symbolism to perform operations on polynomials	• graphs are used as a basis for developing the need to solve equations	131
• solve quadratic equations by factoring	• students investigate how equations can be solved through factoring	133
• expand and factor polynomial expressions using perimeter and area models	• factoring using algebra tiles and patterns are developed for some quadratics of the form $ax^2 + bx + c$	134

Complete all questions from Investigation #7 (Pg.130) in your notebook.

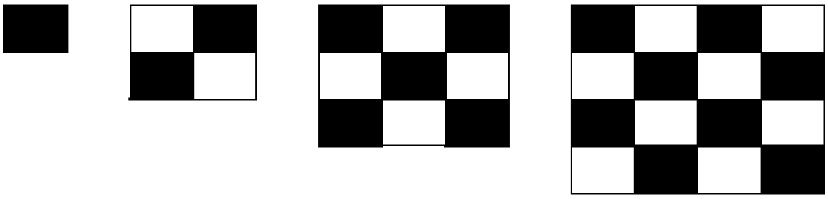
"Part A"

Investigation #7 – More Patterns and Graphs (p 130) Section 3.5

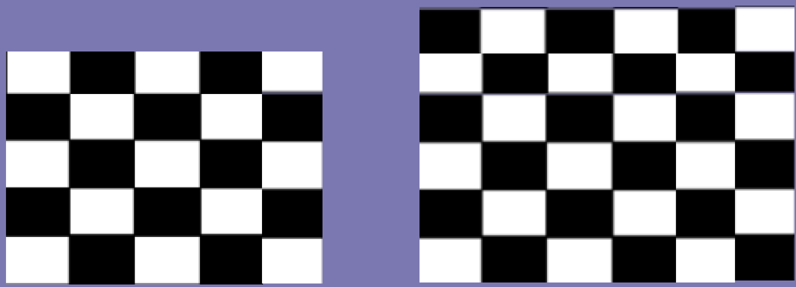
Purpose

To Explore a pattern and use it to create a model for tiling a floor.

Miguel tiled a floor using the pattern shown below. Each square tile is **0.5m wide**



Draw the next two pictures in the pattern



"Part B"

Questions

1) Complete the table of values below.

Tiles per Side			Area of ONE Tile (m^2)	Total Number of Tiles	Total Area Covered (m^2)
Number	Length of Side(m)	Width of Side (m)			
1	0.5	0.5	0.25	1	0.25
2	1	1	0.25	4	1
3			0.25		2.25
4			0.25		
5			0.25		
6			0.25		

"Part B"

Questions

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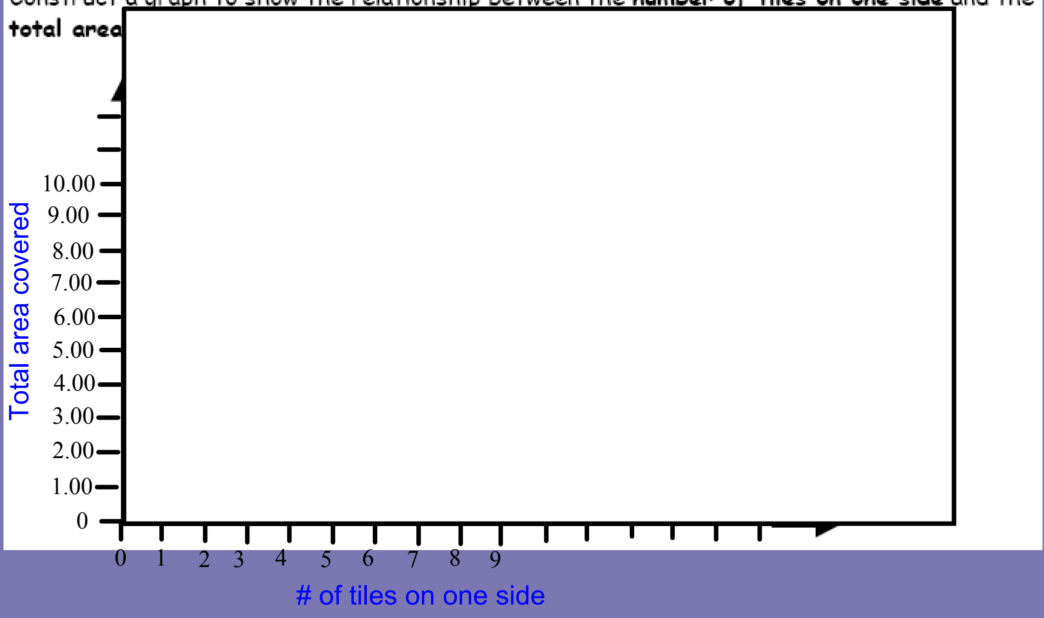
1	0.5	0.5	0.25	1	0.25
2	1	1	0.25	4	1
3	1.5	1.5	0.25	9	2.25
4	2	2	0.25	16	4.00
5	2.5	2.5	0.25	25	6.25
6	3	3	0.25	36	9.00

"Part C"

Identify the independent and dependent variables for the above graph.

Independent → Dependent →

Construct a graph to show the relationship between the **number of tiles on one side** and the **total area**



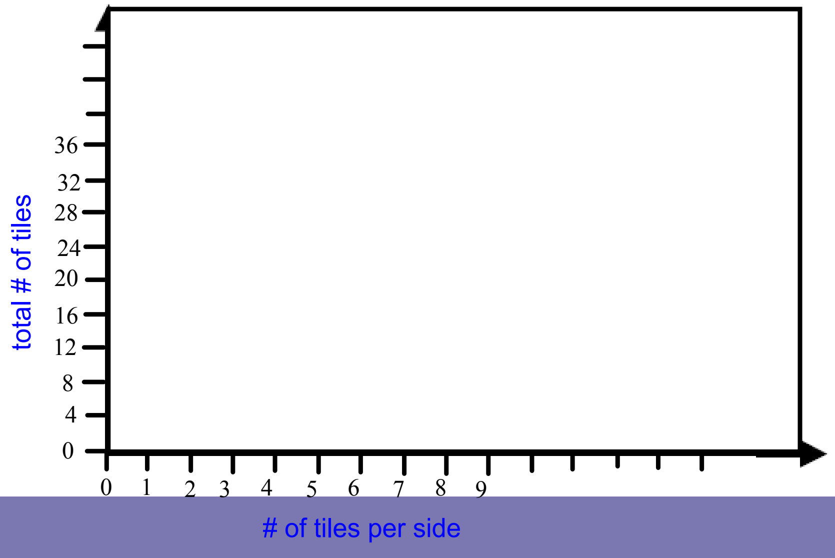
"Part D"

How is the pattern seen in the above graph like the pattern from Investigation 1? How is it different?

Both are discrete data sets. The graph from Investigation 1 forms a linear function (all in a straight line). These do not form a straight line.

"Part E"

Construct a graph to show the relationship between the **number of tiles per side** and the **total number of tiles**.



"Part F"

Compare the two graphs from B) and E).
How are the graphs alike?
How are they different?

Both graphs share the same curved shape and both involve discrete data. One graph should appear to be steeper than the other (if the same axis scale is used)

"Part G"

Describe the pattern that connect the **number of tiles per side** to the **total number of tiles**.
Express your pattern in words.

The total number of tiles is the square of the number of tiles per side. For example, if one side has 3 tiles the total number of tiles is 9 (3^2)

"Part H"

Describe the pattern that connects the total area covered to the total number of tiles.
Express your pattern in words.

The total area is the square of the length of a side. For example, if one side has 3 tiles, a length of 1.5m, the total area is 2.25m^2 (1.5^2).

Answer the Investigations Questions Pg.131 #1 & 2

These predictions can be made with the table of values and/or the graph.

1. (A) 144(0.5)(0.5) = 36m2
   (B) table of values and/or graph
   (C) Estimating directly from the graph doesn't give you confident results
   (D) The accuracy of any method could be checked with any of the other methods. You may have also noticed that a formula or relation could be used.

2. (A) and (B): If 81 tiles are used, then there would have to be 9 tiles per side (9 x 9 = 81). If there are 9 tiles per side, the total side length is 4.5m (9x0.5). The total area is 20.25m^2 (4.5^2).
   (C) Estimating directly from the graph doesn't give you confident results.
   (D) The accuracy of any method could be checked with any of the other methods. You may have also noticed that a formula or relation could be used.

FOCUS "K"

Pg. 131

How is the number **of tiles per side** related to the **total number of tiles**?

___

___

Write an equation to connect then **number of tiles per side** and the **total number of tiles**.

___

Write an equation to connect the total area covered and the total number of tiles.

___

a) Use the equation above to determine how many tiles would be needed to cover an area of 150m^2.

___

___

___

ANSWERS

FOCUS "K"

Pg. 131

How is the number **of tiles per side** related to the **total number of tiles**?

The total number of tiles = (number of tiles per side) x (number of tiles per side)

Write an equation to connect then **number of tiles per side** and the **total number of tiles**.

$y = x^2$ (y is the total # of tiles; x is the number of tiles per side)

Write an equation to connect the total area covered and the total number of tiles.

Total Area = (area of one tile) x (Total number of tiles)

Area of one tile is 0.5m x 0.5m = $0.25m^2$

Therefore, $y = 0.25x^2$ (y is the total area; x is the number of tiles per side)

a) Use the equation above to determine how many tiles would be needed to cover an area of $150m^2$.

$y = 0.25x^2$ (y is the total area; x is the number of tiles per side)

$150 = 0.25x^2$ Solve for x

$x = 24$

Use this chart to create graphs for Focus K

Questions

1) Complete the table of values below.

Tiles per Side			Area of ONE Tile (m^2)	Total Number of Tiles	Total Area Covered (m^2)
Number	Length of Side(m)	Width of Side (m)			
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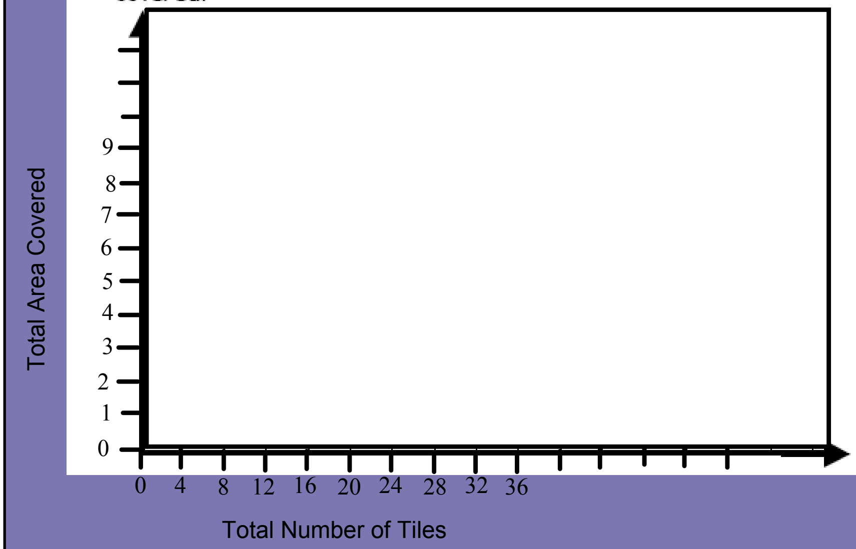
4	2	2	0.25	16	4.00
5	2.5	2.5	0.25	25	6.25
6	3	3	0.25	36	9.00

b) Construct a graph that compares the **total number of tiles** used with the **total area covered**.



c) How is the graph above different form the graphs in 2) and 5)? (Parts C and E)

This graph shows the total number of tiles used and not only the number of tiles on one side of the pattern. The equation of the line is y = 0.25x (y = mx + b; the y-intercept is zero)

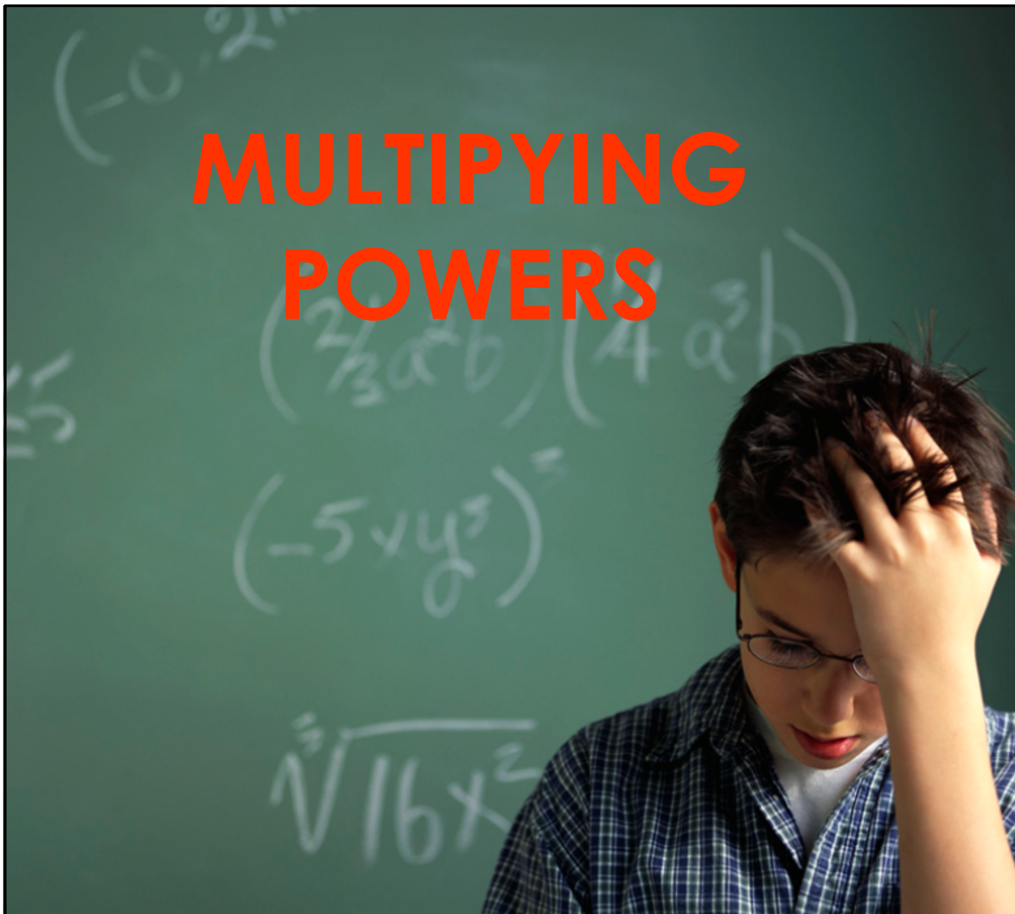
Monday, December 20th

- Reminder: Test on Sections 3.1, 3.2, 3.3, 3.4 on Wednesday

(Pass in completed review before test for bonus points!)

- Check answers to questions from Section 3.4
- Review rearranging formulas
- Begin Section 3.5.......Review Exponent Laws

Review of Exponent Laws



POWERS

EXPONENT

4^2

BASE

POWER

x^2

* EXPONENT LAW 1

- PRODUCT OF POWERS

$(x^3)(x^5) = x^8$

- $n^a \times n^b = n^{a+b}$

$(x^2)(y^3) = x^2y^3$

- Multiplying powers with the same base

$n^a \times n^b = n^{a+b}$ (Product of Powers)

- To multiply powers with the **same base:**

- **KEEP THE BASE**
- **ADD THE EXPONENTS**

- **EXAMPLE:**
- $3^3 \times 3^4 = 3^7$

EXAMPE 2:

$$\left(\frac{-4}{5}\right)^2 \times \left(\frac{-4}{5}\right)^3 = \left(\frac{-4}{5}\right)^5$$

Exponent of 1 you don't have to show it

$$(1.1)^3\,(1.1)^2(1.1) = (1.1)^6$$

✱ EXPONENT LAW 2

- POWER OF A POWER

$(x^2)^4 = x^8$

$(a^2 \cdot b^3)^4 = a^8 b^{12}$

- $(x^m)^n = x^{mn}$
- Multiply the two powers together.
- Example:
- $(5^2)^3 = 5^6$

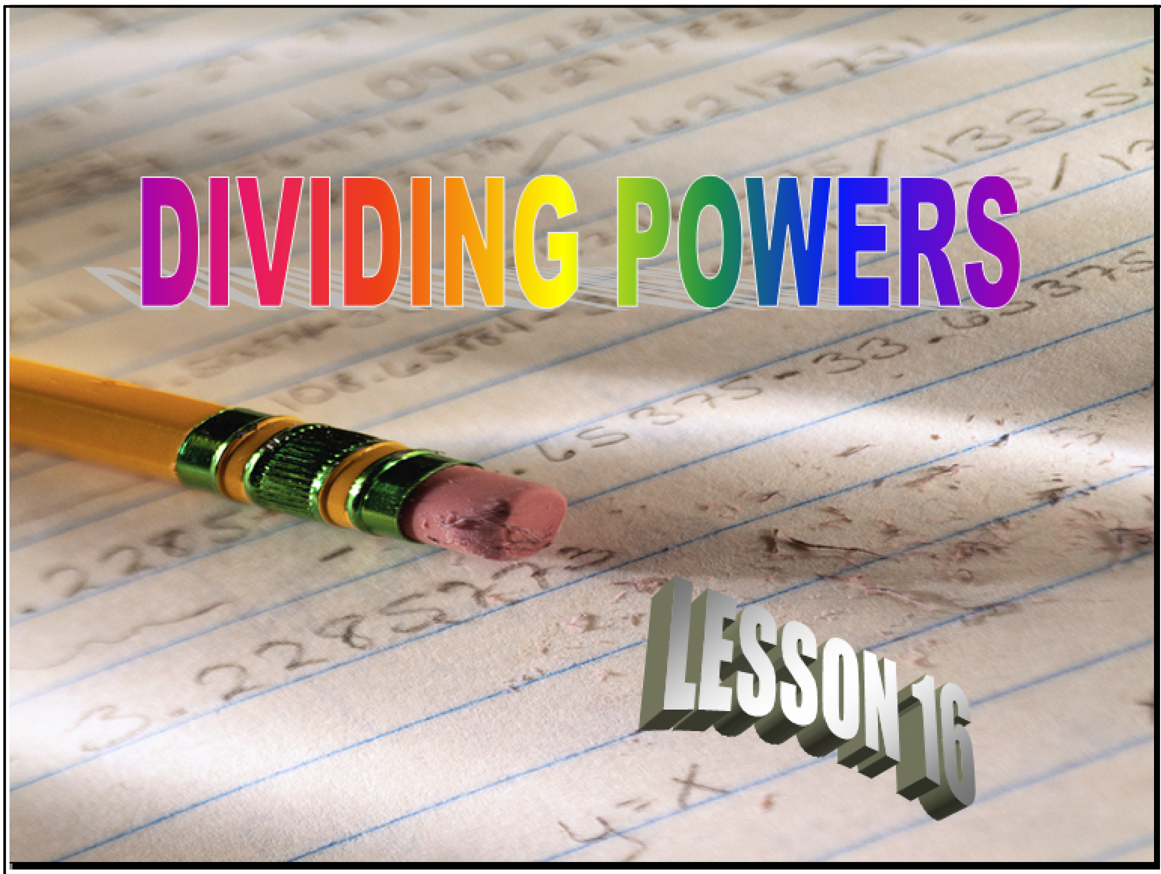
EXAMPLE – $(x^m)^n = x^{mn}$

$(3^2 \times 3^4)^3$

$= (3^6)^3$

$= (3^6)(3^6)(3^6)$

$= (3^{18})$



✱ EXPONENT LAW 3

- QUOTIENT OF POWERS

$$\frac{x^5}{x^3} = x^2$$

- $x^a \div x^b = x^{a-b}$

Dividing Powers with the same base

$x^a \div x^b = x^{a-b}$ (Quotient of Powers)

- To divide powers with the **same base:**

- KEEP THE SAME BASE
- SUBTRACT THE EXPONENTS

- **EXAMPLE:**

$$\frac{3^7}{3^2} = 3^{7-2} = 3^5$$

TRY THESE

$$4^2 \times 4^3 \div 4^4$$

$$\frac{8^{13}}{8^4}$$

$$\frac{5^4 \times 3^9}{(3^2)^3}$$

EXPONENT LAWS #1-3

Product of Power $n^a \times n^b = n^{a+b}$

Ex: $(x^2)(x^3) = x^5$

Power of a Power $(x^m)^n = x^{mn}$

Ex: $(x^3)^2 = x^6$

Quotient of Power $x^a \div x^b = x^{a-b}$

Ex: $\frac{x^5}{x^3} = x^2$

You need to have these memorized if you already don't!!!!!!

EXPRESS AS A SINGLE POWER

1) $3^6 \div 3^4$

2) $\frac{3^7}{3^2}$

3) $\frac{(5^3)(5^4)}{5^2}$

4) $(6^3)(7^8)$

5) $\frac{(3^5)(6^2)}{3^2}$

6) $\frac{(3^3)(3^4)(5^2)}{(3^2)(5)}$

7) $\frac{(4^3)^2\,(4^2)}{(4^2)}$

ZERO POWERS

ZERO EXPONENT

#4. X^0 is defined to be equal to 1

$\boxed{X^0 = 1,\ \text{where}\ \ x \neq 0}$

Exponent Law #4

Any non zero base raised to the exponent zero equals 1

Ex. $x^0 = 1$ $(-x)^0 = 1$

$(-2^2 \times 5^3)^0 = 1$

EXAMPLES

$3^0 = 1$

$(4^2 \times 4^3)^0 = 1$

$\left(\frac{3^7}{3^2}\right)^0 = 1$

EXAMPLES:

ZERO EXPONENTS

$(-5)^0 = 1$

$- 3^0 = -1$

$(2^0)^3 = (1)^0 = 1$

$(-3)^0 = 1$

$\left(\frac{2}{5}\right)^0 = 1$

$- (3)^0 = - (1) = -1$

$(-6^{10})^0 = 1$

NEGATIVE EXPONENTS

x^{-n} is defined to be the reciprocal of x^n

#5

* That is $x^{-n} = \frac{1}{x^n}$, $(x \neq 0)$

Ex: $x^{-5} = \frac{1}{x^5}$

Exponent Law #5

EXAMPLES

NEGATIVE EXPONENTS

$3^{-1} = \frac{1}{3}$

Remember that a negative exponent does not mean a negative number but the *reciprocal number.*

$4^{-3} = \frac{1}{4^3}$

The Distributive Property

Expanding

- When we multiply a polynomial by a monomial using the Distributive Law, we say we are **expanding the product**.
- **Product** – multiplying to find an answer

Expanding

- Using the Distributive Law in algebra is called **EXPANDING.**
- **Example: $8x(x - 3)$**

$$8x(x) - 8x(3)$$

$$\boxed{8x^2 - 24x}$$

1. $3xy(4w) = 12xyw$
2. $(-2x)(5w) = -10xw$
3. $(2x^5)(3x^2)(2x) = 12x^8$
4. $(3m^2n)(-5m^3n^2) = -15m^5n^3$
5. $3(x + 5)$
6. $2xy(3x - 5y)$
7. $-3xy(x^2 - 4xy - 2y^2)$

Attachments

Factoring Polynomials - notes.doc

Math 9 Factoring Assignment.doc

Factoring Trinomials worksheet.doc

Factoring GCF.doc